2026 ASEE ANNUAL CONFERENCE June 21–24, 2026 | Charlotte Convention Center, NC
Host Sponsor UNC Charlotte
ASEE AMERICAN SOCIETY FOR ENGINEERING EDUCATION
Paper ID #50901

AI Unplugged for Middle School: Teaching Artificial Intelligence in Pre-College Engineering Education through Food Systems and Agriculture (Curriculum Exchange)

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AI Unplugged

Introduction

Artificial intelligence (AI) is rapidly transforming industries such as manufacturing and agriculture, reshaping how problems are solved, decisions are made, and work is done. As AI becomes more integrated into everyday life, it is crucial for students to gain an early understanding of how these technologies work and how they influence their communities. To achieve this, teachers would benefit from practical and accessible strategies for introducing AI concepts in ways that are developmentally appropriate and engaging to model core AI concepts such as representation, learning, and decision-making.

Purpose and Framework

The AI Unplugged curriculum provides standards-based instructional modules and activities for middle school students grounded in the Challenge-Based Learning (CBL) framework [1] and situated within an agricultural context.

CBL comprises three interconnected phases – Engage, Investigate, and Act – that encourage inquiry, critical thinking, and the solution of real-world problems.

In the Engage phase, students explore a Big Idea and develop it into a meaningful challenge related to AI concepts such as representation, reasoning, learning, and societal impact challenges.

During the Investigate phase, students conduct research, data analysis, and synthesis.

The Act phase emphasizes designing, testing, and refining solutions while reflecting on learning outcomes.

Students engage in AI unplugged activities using simple materials such as cards, paper, and pencils and enable students to thoughtfully apply AI to real-world challenges.

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Overview

This curriculum supports innovation, collaboration, and education, empowering students to contribute meaningfully to their communities and the future of artificial intelligence in manufacturing by:

Contextualize AI in Real-World Challenges: Connect technical AI concepts to industries such as manufacturing and agriculture, highlighting its impact on production, sustainability, food security, and community development.

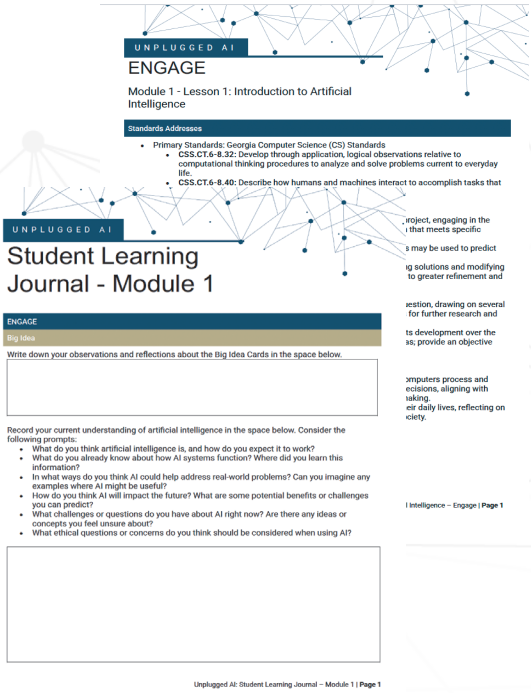
Embrace the "Unplugged AI" Approach: Encourage critical thinking and problem-solving skills through hands-on activities and simulations, making AI accessible to students with varying technical backgrounds and various access to technologies.

Promote Inventiveness, Entrepreneurship, and Ethical Considerations: Foster creativity and encourage responsible application of AI technologies, considering ethical implications and potential societal impacts.

Resources

Each module is designed to provide educators and students with comprehensive resources that support inquiry, problem-solving, real-world connections, and includes the following key components:

- **Teacher Guide:** Each module contains a set of three lesson plans – one for each phase of the CBL framework. Referred to as the teacher guide, these lessons are designed to be flexible, with the understanding that each lesson may span more than one class period, depending on the depth of exploration and classroom needs.
- **Student Learning Journal:** This journal provides students with a structured way to document their learning journey. The ongoing collection of content in the learning journal supports individual and collaborative reflection opportunities, formative assessment, and serves as documentation of the entire learning process.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ENGAGE

Module 1 - Lesson 1: Introduction to Artificial Intelligence

Standards Addresses

- Primary Standards: Georgia Computer Science (CS) Standards
  - **CSS.CT.6-8.32:** Develop through application, logical observations relative to computational thinking procedures to analyze and solve problems current to everyday life.
  - **CSS.CT.6-8.40:** Describe how humans and machines interact to accomplish tasks that

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Student Learning Journal - Module 1

ENGAGE

Big Idea

Write down your observations and reflections about the Big Idea Cards in the space below.

Record your current understanding of artificial intelligence in the space below. Consider the following prompts:

- What do you think artificial intelligence is, and how do you expect it to work?
- What do you already know about how AI systems function? Where did you learn this information?
- In what ways do you think AI could help address real-world problems? Can you imagine any examples where AI might be useful?
- How do you think AI will impact the future? What are some potential benefits or challenges you can predict?
- What challenges or questions do you have about AI right now? Are there any ideas or concepts you feel unsure about?
- What ethical questions or concerns do you think should be considered when using AI?

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[1] Doulougeri, K., Vermunt, J. D., Bombaerts, G., & Bots, M. (2024). Challenge-based learning implementation in engineering education: A systematic literature review. Journal of Engineering Education, 113(4), 1076-1106.

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